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Hard Waste

ENVIRONMENTAL ASSESSMENT OF DUPO
SITE DEEP INJECTION WELL

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Region V

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SECTION 1

INTRODUCTION

Region V of the U.S. Environmental Protection Agency (EPA), has been investigating a RCRA site in Southern Illinois near the town of Dupu (Figure 1-1). An existing unpermitted deep injection well at this location had reportedly been used to dispose of certain unknown hazardous wastes handled at the facility. In order to assess the degree of contamination, if any, caused by the suspected waste injection, Region V initiated an investigative sampling program. PEDCo Environmental, through the U.S. EPA, RCRA implementation contract was issued a task to provide support services in the management of this program. Specifically, PEDCo:

1. Performed a presurvey site visit to determine sampling strategy.
2. Collected representative samples to assess the extent of contamination.

After completion of sampling, the task was modified to include:

3. Disposal of liquid waste pumped from the well during the sampling program.

A presurvey visit to the Dupu site was conducted on May 14, 1983. The well was opened and preliminary liquid waste and air sampling were conducted. A detailed description of presurvey activities is given in Section 2.1.

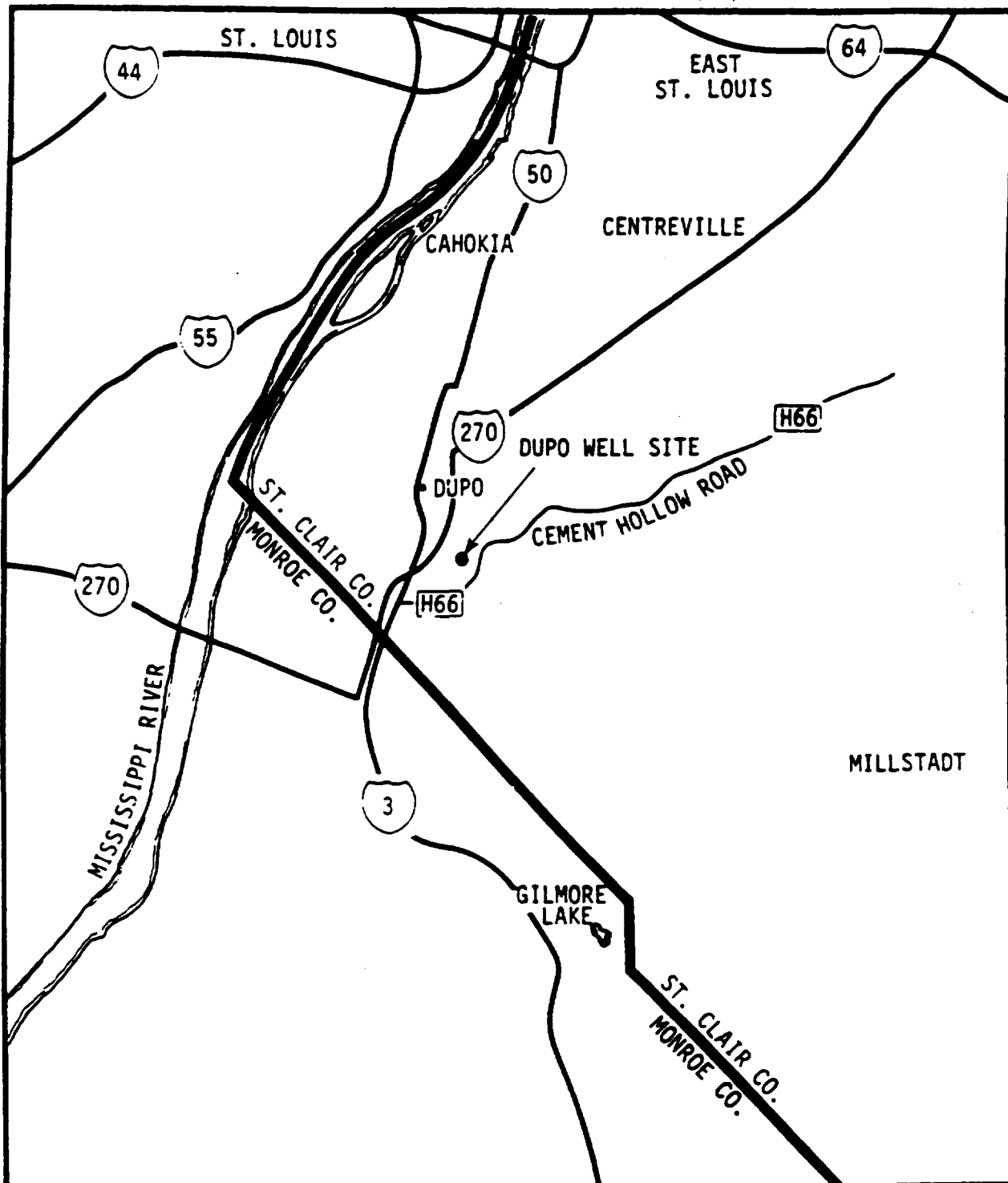


Figure 1-1. Location of Dupo well site.

Preparations for pumping of the deep injection well were undertaken from June 20 to June 23. Pumping and sampling of the well was started on June 23 and completed by June 25. Approximately 10,000 gallons of waste oil and groundwater was pumped into two tankers placed onsite for temporary storage. During the injection well pumping, seven samples were collected from progressively increasing depths.

Two adjacent abandoned oil wells were also sampled at two to three levels using a point source bailer. A total of 5 samples were collected.

Well preparation and sampling procedures are discussed in Sections 2.2 and 2.3, respectively.

All samples collected from June 20 to June 25 were transferred to National Environmental Investigations Center (NEIC) personnel on site. Results of NEIC laboratory analysis are presented in a separate report issued by NEIC.

A composite sample obtained from the two tankers used for storage of the pumped liquid was sent to GCA laboratories for analysis. Results of the oil phase analysis identified sufficiently high levels of PCB's (70 mg/kg) and miscellaneous solvents to require classification as a hazardous waste. Concentrations of these constituents in the groundwater phase were below hazardous levels. Special handling procedures were required in the separation and ultimate disposal of both phases. A detailed discussion is given in Section 3.0.

A list of organizations and their principal involvement with this project are given in Table 1-1.

TABLE 1-1. TABLE OF PRINCIPAL FUNCTIONS AND RESPONSIBILITY

Function	Organization
Principal investigator	U.S. Environmental Protection Agency Region V 230 South Dearborn Street Chicago, Illinois 60604
Overall management	PEDCo Environmental, Inc. 11499 Chester Road Cincinnati, Ohio 45246
Construction service for road improvement and well pumping	John Mathes & Associates, Inc. P.O. Box 330 Columbia, Illinois 62236
Provision of tankers and trans- portion of contaminated waste oil and groundwater	Commercial Cartage Company 343 Axminister Drive Fenton, Missouri 63026
Provision of steel drums for contaminated waste oil	U.S. Steel Corporation
Disposal of contaminated waste oil	ENSCO P.O. Box 1975 American Road El Dorado, Arkansas 71730
Disposal of contaminated ground- water	Chem-Clear 1800 South Stony Island Avenue Chicago, Illinois 60617
Cleaning contaminated tankers	PPM Inc. 10 Central Avenue Kansas City, Kansas 66118

SECTION 2
SAMPLE ACQUISITION

Investigative sampling at the Dupo well site was undertaken in three steps: 1) presurvey site visit, 2) preparation of well for sampling, 3) collection of samples. The presurvey visit was made on May 24, 1983. The well preparation and sampling was conducted from June 20 to June 25, 1983.

2.1 PRESURVEY

On May 24, 1983, a deep well site located near the town of Dupo, Illinois, was visited by the U.S. Environmental Protection Agency (EPA) and PEDCo Environmental, Inc. The members of the site visit were:

Editha Ardiente	U.S. EPA, Region V
Mike Konyu	U.S. EPA, Region V
Kenneth Mensing	Illinois EPA
Douglas Morell	PEDCo
Paul Manna	PEDCo

Initially, a search warrant was presented to the present owner of the facility. The search warrant was signed by the owner in the presence of his legal counsel. The personnel of Federal and State EPA and PEDCo proceeded to inspect the grounds and the deep well injection area.

Two open wells were found within 200 feet of the deep injection well. Static fluid levels were 33.25 feet and 61.25 feet below the top of their respective casings. The static

fluids in each well had an oily layer of unknown thickness. EPA Region V representatives directed that both of these wells should also be sampled. It was agreed that a point source bailer would be used to extract the samples.

The deep injection well was inaccessible for inspection without disconnecting the injection pump. John Mathes and Associates, Inc., a local drilling firm, was contracted to disconnect the injection pump and open the well. During the opening at the well, oil started flowing under artesian pressure.

Because of the flowing oil, the well was closed with a valve. Most of the oil was directed into empty metal containers found onsite. An air hazard assessment was also conducted at this time. The atmosphere at the well head was tested for combustibles; these tests revealed a noncombustible atmosphere. Air samples were also obtained by pumping known volumes of atmosphere through absorbents and impinger sampling trains for specific toxic gases, for subsequent laboratory analyses. Table 2-1 summarizes the results of the air monitoring which was conducted. In addition, two one-liter composite samples of the flowing oil were obtained by PEDCo personnel. The first sample was collected at 1:30 p.m. with a well flow of 0.86 liters per minute (lpm). A second sample was collected at 3:00 p.m. at which time the flow had increased to 1.82 lpm.

The well was closed at about 3:00 p.m. and a locked valve assembly was installed. The keys to the valve were given to the EPA representative present.

TABLE 2-1. ANALYSIS OF AIR SAMPLES COLLECTED AT
DUPO WELL SITE

Parameter	Location	Maximum concentration measured	TLV ^a
Hydrogen cyanide	Well head	0.32 mg/m ³	10 mg/m ³
Hydrogen sulfide	Well head	ND ^b	14 mg/m ³
Arsine	Well head	ND ^b	0.2 mg/m ³
Phosphine	Well head	ND ^b	0.4 mg/m ³
OVA ^c	Breathing zone	3-5 ppm	d
OVA	Well head	300 ppm	d
OVA	Tanker portal	1000 ppm	d
Gamma radiation	Well head	Background	e
Gamma radiation	Breathing zone	Background	e

^aThreshold Limit Values for Chemical Substances in the Work Environment adopted by ACGIH for 1983-84.

^bNon-detectable less than 3 percent of TLV.

^cOrganic vapor analyzer.

^dNo threshold limit values established.

^e0 to 0.1 milli rem per hour considered background.

All EPA, PEDCo, and John Mathes personnel left the site by 3:30 p.m. An estimated 30 gallons of oil was spilled on the ground surrounding the deep injection well. John Mathes personnel returned later that day and early the next morning to cover the spilled oil with absorbent clay.

Based on the information obtained during the presurvey visits, a sampling strategy was developed and preparation made to conduct sampling in June.

2.2 DEEP WELL PREPARATION

In order to determine the characteristics of the materials that were injected into the deep well and the degree of contamination to the surrounding aquifer, it was determined that the well should be pumped. It was decided that the minimum amount of fluid to be removed would be 10,000 gallons, based on 1.5 times the saturated well volume of 6700 gallons.

Removal and subsequent storage of such a large volume of waste liquid required special pumping and handling preparations. Two tankers were obtained from Commercial Cartage for use as temporary storage of the pumped liquid waste. In order to move the tankers onsite it was necessary to have the access road widened and improved. Once the tankers were in place, preparations for pumping the well was undertaken. The placement of the tankers relative to the injection well is shown in Figure 2.1.

The original pumping strategy was to insert a stainless steel positive displacement pump inside the well casing; however,

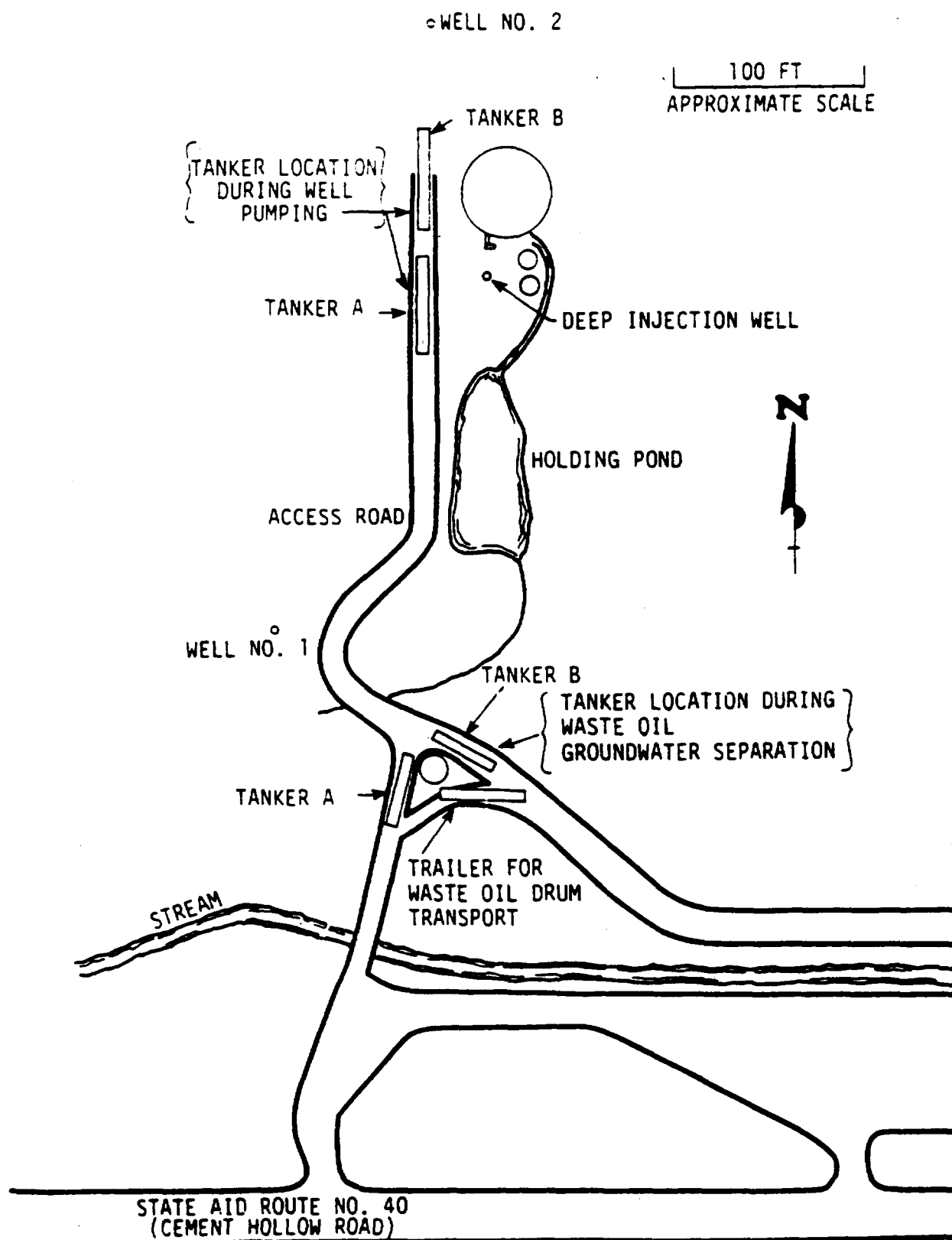


Figure 2-1. Map of Dupo well site.

a buildup of scale and corrosion at the top of the casing prevented insertion of the pump. It was then thought that the artesian pressure of this well would be sufficient to allow flow into the storage tankers. This also proved to be impractical in that the flow rate decreased from 2 gal/min to 0.27 gal/min over a 16-hour period.

After the first two methods failed to provide sufficient flow from the well, it was decided that "swabbing" of the well would be necessary. This method required special equipment and crew. A schematic of the well transfer and swabbing configuration are shown in Figure 2-2. On the down stroke, liquid flows through check valves of the weighted swab head. On the lift stroke, liquid above the swab was lifted and forced through the transfer tubing into the storage tanker. If a sample was desired, the sample valve was opened during the lift stroke allowing a representative sample to flow into the sample container.

2.3 SAMPLE ACQUISITION

Following the presurvey investigation and well preparation, a sampling program was conducted to determine the characteristics of the materials that were injected and the degree of contamination to the aquifer surrounding the well. Several samples were obtained as the fluid was pumped from the well to the tankers. These samples were taken at periodic intervals based, on the volume of the liquid pumped. The first sample was obtained within the first 100 gallons, while the remainder of the samples were taken at 2000 to 3000 gallon intervals.

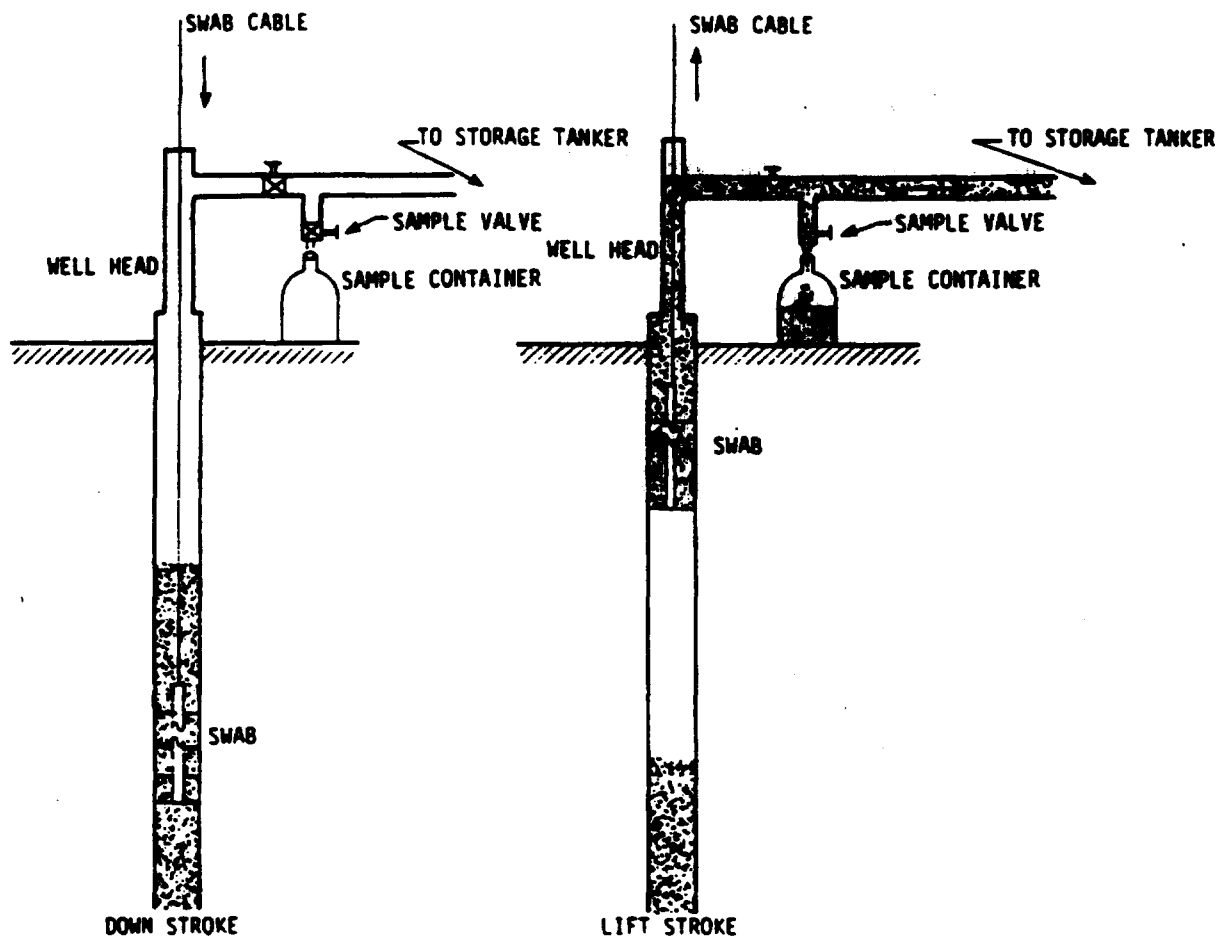


Figure 2-2. Schematic of well swabbing procedure.

These samples represented fluids from the well at progressively increasing depths and fluids in the aquifer at progressively increasing lateral distances from the well. A total of 10,000 gallons was pumped during sampling of the injection well.

Samples were placed into 1-gallon sample containers and given to the **National Enforcement Investigations Center (NEIC)** personnel onsite. At the completion of pumping from the injection well, a 3-gallon composite sample was taken from the tankers. One gallon of the sample was provided to NEIC for analysis; the remaining was retained by PEDCo.

The two abandoned oil wells within 200 feet of the injection well were also sampled (see Figure 2-1). Three samples were taken from oil well No. 1 and two from oil well No. 2 using a Teflon point source bailer. The sampling point depths are given Table 2-2.

A listing of the samples collected from the deep injection well along with other samples collected at the Dupo site are given in Table 2-2.

The NEIC laboratory in Colorado was responsible for the analysis of all samples collected. Results of these analyses are contained in a separate report issued by the NEIC laboratories.

Half of the composite sample retained by PEDCo was forwarded to GCA Corp., Bedford, Massachusetts for analysis. Results of this analysis are given in Appendix A. These results were used for the classification and determination of proper disposal procedures for each phase of the liquid waste stored in the onsite tankers.

TABLE 2-2. LISTING OF SAMPLES COLLECTED AT DUPO WELL SITE

Date	Well	Location ^a in well	Sample size	Sample disposition	Comments
June 20	Deep injection	50-100 gal	3 (1 gal)	NEIC Lab	
June 23	Deep injection	1,000 gal	3 (1 gal)	NEIC Lab	
June 24	Deep injection	3,000 gal	7 (1 gal)	NEIC Lab	
June 24	Deep injection	5,000 gal	3 (1 gal)	NEIC Lab	
June 24	Deep injection	8,000 gal	3 (1 gal)	NEIC Lab	
June 24	Deep injection	10,000 gal	3 (1 gal)	NEIC Lab	
June 25	Deep injection Storage tanker	Composite	3 (1 gal)	NEIC Lab (1 gal) PEDCo (2 gal)	1 gal sent to GCA for analysis. See Appendix A
June 21	Oil No. 1	-60 ft	0.25 gal	NEIC Lab	Top of well
June 21	Oil No. 1	-400 ft	0.25 gal	NEIC Lab	
June 21	Oil No. 1	-560 ft	0.25 gal	NEIC Lab	Bottom of well
June 23	Oil No. 2	-30 ft	0.25 gal	NEIC Lab	Top of well
June 23	Oil No. 2	-85 ft	0.25 gal	NEIC Lab	Bottom of well

^a Location for injection well sampling is based on gallons of liquid pumped from the well at the time the sample was collected. Oil wells 1 and 2 locations are relative to the top of the well casing.

SECTION 3

MANAGEMENT OF RECOVERED WASTE

During the sampling phase of the Dupo well investigation, approximately 10,000 gallons of liquid consisting of waste oil and groundwater had been pumped from the well under investigation into two tankers located onsite. The tankers were secured and locked and remained onsite from June 25 until August 8 at which time arrangements for disposal had been made.

Results of the composite samples analysis showed that the pumped liquid waste consisted of two separate and distinct phases, waste oil and groundwater. Analysis of the oil phase identified sufficiently high levels of PCB's (70 mg/kg) and miscellaneous solvents to require classification as a hazardous material. Concentrations of these constituents in the groundwater portion were found to be below hazardous levels. Because of the two-phase nature of this liquid, special handling was required prior to disposal to separate the upper layer of waste oil from the lower water layer. The hazardous waste oil portion required transfer into steel drums prior to shipment to ENSCO facilities in El Dorado, Arkansas for disposal by incineration. The remaining groundwater portion was transported in the two tankers to Chem Clear's facilities in Chicago, Illinois for treatment and disposal. Prior to their return, both tankers

were cleaned by PPM, Inc. of Kansas City, Kansas. The cleaning residue was shipped to ENSCO for disposal. Commercial Cartage, Fenton, Missouri, was contracted to handle transportation of both constituents to these respective disposal locations. A flow diagram presented in Figure 3-1 outlines all disposal activities. Manifest numbers are inserted at the appropriate transfer points on the flow diagram. Copies of all manifests are contained in Appendix B. The following is a chronological description of the disposal activities.

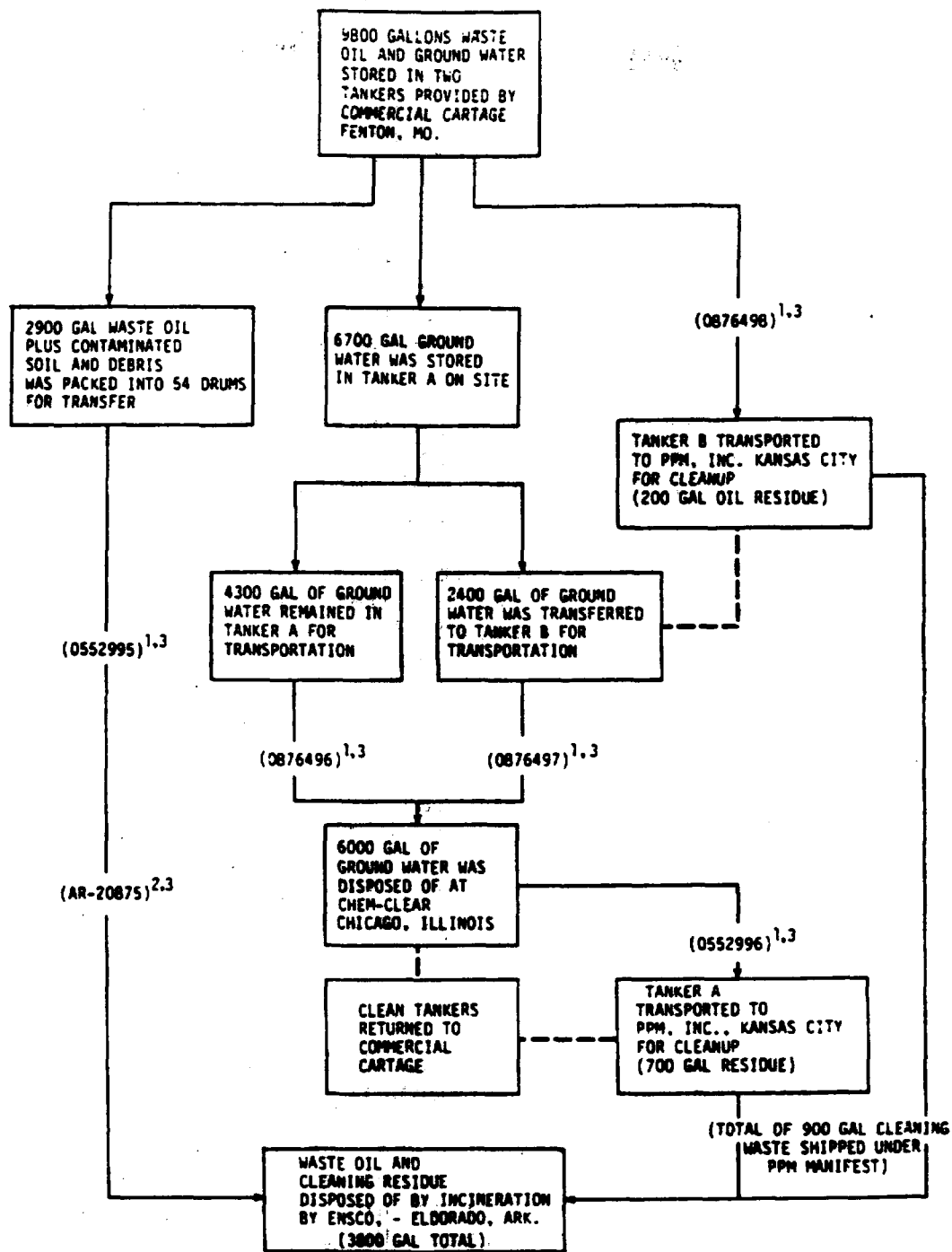
August 7:

PEDCo's three-man crew arrived at St. Louis in preparation for the removal of hazardous waste from the Dupo, Illinois well site.

August 8:

The site was entered for the purpose of transferring approximately 10,000 gallons of hazardous waste liquids that were previously pumped from the injection well. This material was being stored in two tankers located at the site. Road access to the tankers was found to have been washed out at three locations. Two loads of crushed stone were required to make the road passable for the tankers. A check of oil levels in the tankers appeared to indicate that a larger volume of oil was present than originally anticipated. The PEDCo office was notified to order additional barrels. A tractor from Commercial Cartage Co. arrived onsite to move the tankers from the well head to a flat area near the highway where transfer of the liquid waste was to be made (Figure 2-1). Due to a recent rain, the soft ground made it necessary to bring in a tow truck and backhoe in order to hook up and move the tankers to level solid ground.

Later in the day, the PEDCo crew was notified by the U.S. attorney's office in East St. Louis that no transfer of waste was to be made until further notice because of legal complications. The waste material was considered evidence and its removal from the property could not be made until a formal notification of the former operator of the site was made.



- 1 STATE OF ILLINOIS MANIFEST NUMBER
 2 STATE OF ARKANSAS MANIFEST NUMBER
 3 ALL MANIFEST ARE PRESENTED IN APPENDIX A

Figure 3-1. Management of Recovered Waste from Dupo Deep Injection Well.

August 9:

A tractor trailer arrived onsite with the drums for transferring the oil portion of waste to ENSCO facilities in Arkansas. The driver and tractor remained onsite until information arrived that the decision on the legality of transferring the liquid would not be made until 4:00 p.m. on August 10.

Meanwhile, tubing used to transfer waste from the well to the tankers during the well sampling in June was cut into sections and packed into drums. All contaminated material at the well was cleaned and/or prepared for removal.

Later, waste was found leaking from the top of one of the tankers. Further investigation revealed that liquid and air in the tanker may have expanded from radiation from the sun. Because of the slope at which the tanker had been parked the relief valve inlet was submerged in the liquid, thus causing the waste to be pushed out through the relief valve. Approximately 400 gallons of wastewater from the bottom of the tanker was siphoned into drums before the relief valve inlet was cleared of the liquid and safe conditions were established. Approximately 2-3 gallons of waste spilled onto the ground and was covered with absorbent clay for subsequent cleanup.

August 10:

All tubing and contaminated material at the well were packed into drums and sealed. Wastewater which had been siphoned into drums the previous day was pumped into a partially filled compartment of tanker A. At 5:00 p.m., the crew was informed that transfer of the waste oil was to take place the next day (August 11).

August 11:

Transfer of waste oil was started at 6:30 a.m. Oil from tanker A was siphoned from each compartment into drums. Subsequently, water from the bottom of tanker B was pumped into the partially filled compartments of tanker A. The remaining oil from tanker B was then pumped into drums. A front-end loader was required to load full drums into the trailer and to transfer trash drums from the well head to the trailer. During filling of drums one accidental splash (estimated to be one-half gallon) occurred. The personnel involved and the ground area were cleaned up prior to continuation of loading. The transfer area was cleaned and all materials and hoses used were placed into drums and loaded into the trailer. Manifest forms were completed and accepted for transfer by Commercial Cartage to ENSCO for incineration of the drummed oil. The trailer containing oil drums and the empty tanker B were removed from the site and the site was secured. Tanker A containing wastewater was locked and remained onsite

for disposal at a later date. At the time of departure, all keys were returned to the EPA representative present. Tanker B was then transported to PPM, Inc., Kansas City, Kansas for cleaning.

August 28:

PEDCo personnel arrived at St. Louis in preparation for the transfer and removal of contaminated groundwater from the Dupo, Illinois well site.

August 29:

PEDCo personnel arrived at Dupo well site with EPA representatives at 7:00 a.m. Driver and tractor from Commercial Cartage Co. arrived at 7:15 a.m. Upon entering the site, it was found that six of the eight tires of tanker A containing the groundwater were flat. Further investigation showed that the valve cores had been removed. Commercial Cartage was notified and a repair crew was dispatched. One of the locked compartment hatches atop the tanker had been forced open, but no other damage or tampering with the tanker or groundwater was noted.

The repair crew arrived at 9:00 a.m. and all tires were re-inflated.

Subsidence of the railroad tie on which the tanker had been resting presented additional problems in hooking up the tanker. It was necessary to jack up the front of the tanker to provide sufficient clearance to allow hook-up, which was concluded at 2:00 p.m.

Tanker A was transported to the Commercial Cartage facilities where 2400 gallons of the groundwater were transferred to tanker B. This was required to meet highway weight limits. No problems or spillage occurred during transfer. Manifest forms were completed and accepted for transfer by Commercial Cartage to Chem-Clear Corporation for treatment and disposal.

Two sets of soil samples were collected at the well site for the purpose of determining the extent of soil contamination (Figure 3-1, for subsequent possible removal and disposal of this material. One set was collected within a 15-foot radius of the well head and a second set from the shoreline of the small holding pond located downgradient from the well. Both composites consisted of 6 individual samples collected from the top 3 to 6 inches of soil. Samples were transported to PEDCo's laboratory for storage pending further action by the U.S. EPA.

During the collection of the soil samples, it appeared that more oil was present on the pond and shoreline than observed during the previous visit of August 7-11, 1983. Further investigation

identified two seepage areas near the base of the 50-foot diameter open top holding tank located at the site. In both cases, liquid waste oil was present. It was also evident that surface runoff water containing waste oil had flowed to the pond by the path indicated on the map shown in Figure 3-2.

A second and probably more pressing potential problem was that the liquid level in the 50-foot tank had risen to within 6 inches of the top. Based on an average rainfall of 3 to 4 inches per month recorded for Southern Illinois, it was determined that an overflow could occur within the next six months. Both problems were pointed out by PEDCo personnel to the U.S. EPA representative while onsite.

Based on the likelihood of continuing contamination, it was decided by EPA that the removal of contaminated soil from the perimeter of the pond would not be a cost-effective effort at that time; recontamination of this area was likely to continue until cleanup of the entire area.

On August 30, the two tankers containing groundwater were transported to Chem-Clear, Chicago, Illinois for treatment and disposal.

Prior to their return, the tankers used for storage and transportation of the waste liquid were taken to PPM, Inc., of Kansas City, Kansas for cleaning. Residue from the cleaning operations were transported to ENSCO for disposal (under PPM, Inc., Manifest).

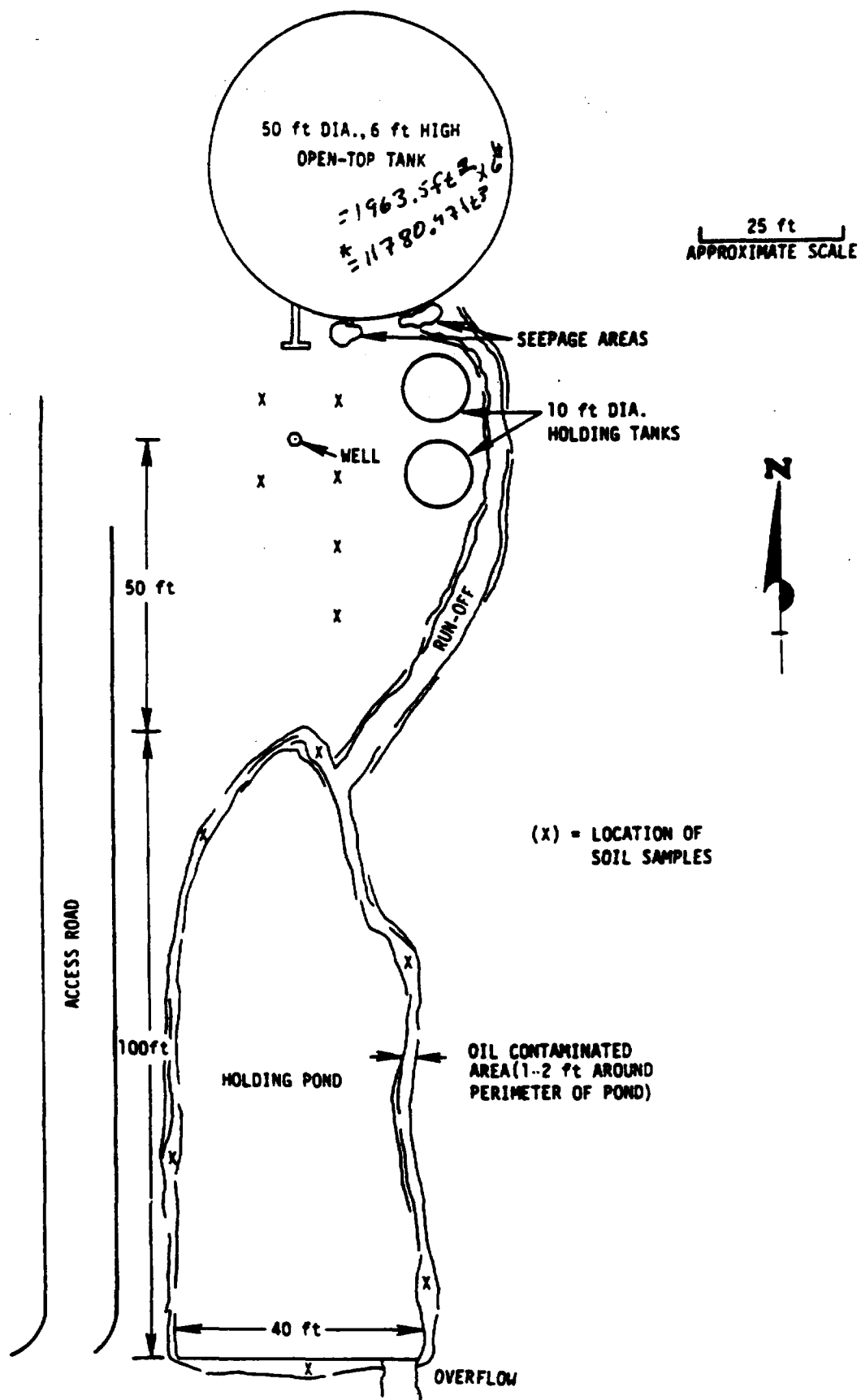


Figure 3-2. Dupo well site.